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Agricultural Experiment Station
University of Kentucky
THOMAS P. COOPER, Director

PREVENTION AND ERADICATION OF BANG'S DISEASE

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Prevention and Eradication of Bang's Disease

By W. W. DIMOCK

For many infectious diseases of farm flocks and herds no specific cure is known. For a few diseases biological products, in the form of vaccines, serums and antitoxins, are used as immunizing agents to protect the animal against infection. Prevention by vaccination is highly effective for such diseases as anthrax and blackleg of cattle, tetanus and contagious abortion of horses, rabies and distemper of dogs, chickenpox of poultry, and hog cholera. For many other infectious diseases of animals biological products have not been developed that are altogether effective as immunizing agents. In this group the most outstanding examples are pullorum disease of poultry, glanders and dourine of horses, and tuberculosis, Johne's disease and Bang's disease of cattle. Efforts to protect animals against these infections must continue to be directed along the well-known lines of disease prevention and eradication, based on sanitation and isolation, until such time as specific cures are discovered or effective products for immunization are developed.

Fortunately we have highly accurate methods of diagnosis for many of the chronic infectious diseases of animals. Investigation and research, carried on during the last forty years, have definitely established all the essential characters of Bang abortion infection. Further, a method of dealing with this infection, worked out during the last 15 years, has been shown repeatedly to be entirely reliable, effective and economically sound.

Before starting any major effort to deal with disease it must be recognized that the first step fundamental to success is to establish a correct diagnosis. For the diagnosis of *Brucella abortus* infection in cattle and other animals we have in the

blood agglutination method a specific biological test that is highly accurate when properly applied and conducted. Discrepancies and conflicting results from the use of this test have in the past been due largely to factors that had nothing whatever to do with the specificity of the test itself. While no method of diagnosing a disease can be said to be absolutely perfect in every instance, it can be said with confidence that the agglutination test for Bang abortion disease of cattle, when properly carried out, comes as near being consistently reliable as any known method of diagnosing any one of the many infectious diseases of man and animals for which diagnostic biological tests have been developed.

There are in general three ways by which medical science may hope to deal with infectious diseases:

First, by the use of drugs or chemicals that have been shown to be effective in their action against the causative agent.

Second, by vaccination with specific immunizing agents.

Third, by sanitary measures such as cleaning and disinfecting premises, isolating or disposing of diseased animals, and guarding against the introduction and spread of infection.

Attempts to cure Bang abortion disease by the administration of drugs and chemicals have so far failed.

Protection against Bang abortion disease by vaccination has received special attention. Efforts to develop products for the effective immunization of cattle against this disease, however, have not been productive of definite results.

Vaccination as a routine procedure in the field should not be practiced indiscriminately on all herds. In those where a high percent of the animals are infected and for various reasons it may not be possible to attempt eradication, and in those where the infected animals can be kept isolated from non-infected animals on the same farm, vaccines may, if desired, be given a trial. In any case, the product used should be so prepared or treated as to eliminate all possibility of introducing new infection.

For dairy cattle and for the breeding herd of beef cattle the desirability of making an effort to put Bang abortion disease under control is universally recognized. There are now many Bang-disease-free herds in this country and many herds that are in the process of being freed from the disease. The clean herd is a source of great satisfaction and owners of such herds are, on the whole, enthusiastic supporters of the plan to eradicate the infection and maintain only Bang-disease-free herds. In dealing with herds that are badly infected, overenthusiasm and attempting to proceed too rapidly in eliminating the infection are to be avoided. On the other hand, to hesitate, delay, and attempt to salvage individual animals that are infection carriers, when so doing endangers the whole scheme of procedure, is also to be avoided. To be really successful in establishing and maintaining a Bang-disease-free herd requires confidence in the fundamental procedure, close attention to details, and a determination that never falters.

Only one plan is known to be effective for dealing with Bang abortion disease and that is eradication. Assuming that after due consideration it is decided to start a plan leading to eradication and the maintenance of a Bang-disease-free herd, the first step is to blood test all animals in the herd, including calves that have reached the age of five or six months. After it has been determined which animals in the herd are infected it becomes possible to formulate a definite method of procedure. While the plan in every instance should lead to final eradication and the establishment of a Bang-disease-free herd, the details may be varied within certain limits to fit a particular situation. The best method of procedure to follow in a given instance depends on the number of reactors, size of the herd, facilities for maintaining two units, including both stabling and pasture, value of the herd, particularly the reactors, their breeding and production records, age, health, and the type of business followed. It is impossible to write out in detail all the factors to be considered in establishing and maintaining a Bang-disease-free herd. However from many years of experience

and experimentation it has been found that there are certain definite requirements to be observed in the execution of any method which has for its final object the prevention and eradication of the disease. The most important of these is recognition of the fact that the agglutination test is the only practical and accurate method of determining which animals in a herd are actually carriers of *Brucella abortus.*

Infected cows are the principal source of infection. Infection is spread from animal to animal by direct contact and association more often than thru indirect channels. All infected cows are active spreaders following abortion. Many infected cows are spreaders at all times, the microorganisms escaping from the body thru the natural openings and the udder. The great majority of infected cows are active spreaders at the time of parturition and for 30 days following. Reacting cows should be isolated at calving time and maternity stalls used by them should not be used for non-reactors. Stable sanitation is to be a daily routine, and breeding hygiene, both for the individual and for the herd as a whole, must be made effective. No cow, either positive or negative, should be bred sooner than sixty days following parturition and none should be bred that show evidence of inflammation of the genital tract.

The conditions favorable and unfavorable to the life of *Brucella abortus* outside the animal body are fairly well known. If the microorganism is exposed to sunlight and to thoro drying it lives for only a short time. Under carefully conducted experimental test it was found that the microorganism lived less than five hours when exposed to direct sunlight, five days on sacking at room temperature, thirty days on sacking in a basement, and four days in soil dried quickly. In wet, unheated soil, in water, in stable manure and in material containing nutrient it lived from 60 to 120 days. In general it can be said that low temperature, moisture and nutrient material favor longevity, while direct sunlight, high temperature, drying and the absence of nutrient material tend to shorten the time that the microorganism remains alive outside the animal body. These observa-

tions may be made of practical value in stable and yard sanitation directed against this infection.

For the eradication plan of dealing with Bang abortion disease there are three main methods of procedure. A modification of one of these gives the four methods described in this Circular. **For all the first step is to blood test all animals in the herd, including calves that have reached the age of five months.** After it is known which individuals and how many are positive to the agglutination test for Bang abortion infection it becomes possible to decide what method of procedure it is advisable to follow.

THE ERADICATION PLAN

Method 1. Immediate removal of all reactors on the first and all subsequent tests. Especially to be recommended for small herds and large herds in which the number of reactors is small. The maintenance of a small, separate unit of reactors usually is unprofitable as to labor, equipment and production. Prompt disposal of all reactors does away with the principal source of infection. It simplifies the handling of the negative unit, the raising of heifers and the breeding operations. It may be advisable and economical to hold selected reacting cows for a short time in order to have the calves and for milk production, until such time as it becomes possible to make satisfactory replacements. The isolation of a few cows for a short time usually can be made effective. If there are no known reactors on the farm intervals of retests on the negative herd may be lengthened.

Method 2. Maintain two units; an infected unit and a non-infected unit. This method has a wide range of application and is to be recommended for all large herds where one-fourth to one-half of the animals prove positive on the first test. The essential requirements are two stables or barns and sufficient acreage to provide separate yards and pastures. Occasionally dairy organizations and beef-cattle breeders may be operating two fully equipped farms, in which case a division of the cows

into reactors and non-reactors causes little or no modification in operative procedure. The use of two farms in this way almost wholly eliminates the infected unit as a source of infection and solves at once the question of separate yards and pastures for the two units on the same farm. All animals giving a highly suspicious reaction are to be placed with the positive unit. Those giving only a slightly suspicious reaction, with no history of abortion, may be kept with the negative unit until retested at a later date. If some of the older cows in the herd are known to have aborted, have been positive on a previous blood test, have an unsatisfactory breeding record, or have chronic udder trouble, it will be advisable to place them with the positive unit. This is recommended because it is well known that some cows having once aborted from Bang abortion infection, or that have been infected for some time, tend to build up a tolerance against the infection to the extent that they do not abort. Such animals may be fairly regular breeders, often producing a good flow of milk and, at times, particularly when with calf, give a negative or suspicious reaction to the agglutination test. They will not suffer from association with infected cows. On the other hand they are always a possible source of infection to the negative herd. Our experience has been that approximately 90 percent of cattle showing a suspicious or incomplete reaction will in the course of time become clear-cut positive reactors. As a general rule animals in infected herds, giving a suspicious reaction on the first test, provided they are otherwise apparently normal, may with safety be left with the negative unit until retest when it will be possible to determine their true status. On the other hand, when a herd of cows has once been established as a Bang-disease-free herd, any animals later showing a suspicious or positive reaction to the test should be removed at once.

Method 3. Maintain the whole herd as an infected herd. Method three is not recommended except where it is impossible to follow method 1 or 2. It may be the best method where the number of reactors on first test is high, where facilities for maintaining two units are lacking, or where the value

of cows involved does not justify the additional labor and expense of separation. Under method three a new herd is to be raised from the calf crop and from purchases, preferably calves and unbred heifers. It has been shown that a calf born of an infected mother and kept in the stable with an infected herd, if removed at four to five months of age and placed under conditions that eliminate all chance of infection, will grow to maturity and be free of Bang's disease. When the calves, raised or purchased, have reached maturity and are sufficient in number to make the beginning of a new herd possible, then the old herd is to be disposed of, the barn cleaned and disinfected and the new herd of young cows placed in the old quarters.

Method 4. A modification of method 2 that may be used to advantage where two barns are not available. This provides for maintaining two units that are stabled in the same barn. It is most applicable where the dairy barn has two rows of stanchions. The reactors are to be stabled on one side and the non-reactors on the other. Each group should have a separate entrance and exit with complete separation when outside the stable. A separate maternity stall for each group should be provided. All calves may be raised in the same barn. At five months of age, test the calves and remove them from the calf barn to absolutely clean quarters; retest in sixty days. The cows in the reacting group are to be culled rigidly and all are to be disposed of just as soon as the negative herd can be built up to the minimum number that meets the requirement in milk production. Stabling both groups in the same barn increases the danger of spread of infection to the negative cows; however, if the badly diseased cows in the positive group are eliminated just as soon as they cease to be regular breeders and profitable producers, and all possible precautionary measures are observed, this method of procedure can be used to great advantage.

Whatever method is followed it is always essential to follow recommended practices of breeding hygiene and stable sanitation. For the two-unit herd, if the number of animals justifies, two bulls should be kept, one for the negative and one for the

positive cows. In small herds the same bull may be used for both reactors and non-reactors provided he is a non-reactor and all requirements of breeding hygiene are reasonably well observed. In dealing with a positive herd or unit it should be the accepted policy to remove at an early date all cows showing evidence of chronic mastitis and chronic inflammatory changes in the genital tract; also all chronic aborters, non-breeders, low producers, and animals of inferior quality, from whatever cause. The removal of such individuals limits the spread of infection and materially reduces the danger of infection from the milk supply. No cow in the herd should be bred sooner than two to three months after calving and cows that abort, have retained placenta, or show a discharge, should not be bred until they are known to be in normal breeding condition.

PROTECTION OF THE CLEAN HERD

It is not difficult to keep a herd free of Bang abortion disease after all infection carriers have been removed and the infection has been killed out in the stables and on the premises. There are, however, some very important things to be taken into consideration. Some of the practices that must be observed, if serious setbacks are not to be experienced, are:

1. Annual or semi-annual blood testing.

2. Animals to be added to the herd must first be negative to the agglutination test. If the purchased animal comes out of an infected herd it is to be retested within 30 to 60 days and preferably before being permitted to mingle in the yards or pastures with other cattle in the herd. If new additions are pregnant animals they ought to be held in quarantine until after the calves are dropped, and then tested.

3. No cows in the herd are to be bred to outside bulls.

4. No outside cows are to be bred to bulls used on the negative herd. Exceptions can be made for herds free from Bang's disease.

5. When a cow is due to freshen she is to be isolated, and not returned to the herd, following parturition, until she appears to be perfectly normal.

6. Strict stable sanitation is to be practiced at all times. The stable and yards are to be kept clean and free of such materials as manure, waste hay and straw, old sacks, pieces of boards and trash of all kinds.

7. If an abortion occurs in the negative herd, the cow is to be isolated and blood tested at once. If blood reaction is negative, retest in ten days. If negative on retest, the cow may return to the herd. If positive, remove the cow from the herd and blood test all animals in the herd just as soon as possible.

8. New additions to a herd that is free of the disease are best made from the calf crop. Purchase only such animals as are absolutely necessary to maintain the blood lines and production of the herd.

9. There are many ways in which infection may be reestablished in a Bang-abortion-disease-free herd. Of these, five deserve special mention. First, from infection on the premises that has remained alive since the last outbreak. Second, introduction of new cattle that are carriers of the infection. Third, sources other than animals. Fourth, from other species of domestic animals that may harbor the infection, particularly swine, and, Fifth, from contact with animals and infected stalls and pens at livestock shows.

10. It is never advisable to purchase negative animals out of an infected herd and immediately place them with an established negative unit or herd. If such animals are purchased they should be held in quarantine for sixty days and retested; if pregnant they should be held until after parturition, for retest. This is considered necessary because cows in the early period of incubation of the infection may not show a reaction. A cow that has aborted one or more times and then settled down and later produced a normal calf may, at times during

the period of a year, show a negative reaction, while the same animal after parturition may give a clear-cut positive reaction.

11. A herd is never considered free of Bang abortion disease until every animal has passed at least two consecutive negative blood tests at an interval of three to six months.

Finally, in dealing with Bang abortion disease the agglutination test is our main reliance, but a knowledge of the history of the herd and all individual animals is often indispensable if correct interpretations and recommendations are to be made. The proper application of the agglutination test for the diagnosis of Bang abortion infection requires experience in the use and interpretation of the test and a knowledge of all phases of Bang's disease. Therefore the successful control, prevention and eradication of Bang abortion disease, when a reliable agglutination test has been made, is a question of general policy, management, and detailed procedure by those in charge of the herd. All the information necessary to properly deal with Bang abortion disease is now available. There are very few instances where it would not be possible to work out a method of procedure that would be suitable and advantageous for a given herd. Under the most unfavorable circumstances a great deal can be accomplished in dealing with this disease, and at a minimum expenditure of time, labor and money.

It is unfair and impossible to estimate the importance of Bang abortion infection from a consideration of individual cows and individual herds. A true and accurate estimate of the injury from this disease to the dairy cattle and beef breeding herds of the country can be obtained only by summarizing the history of a large number of herds in which the disease has been present and comparing this with the history and performance of an equal number of herds free of Bang abortion disease.